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as Governing Mechanism for
Competence Development**

**Bernhard Bierschenk¹
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Copenhagen University
Denmark



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Abstract

From a global point of view, the present study concerns the way in which its participants have picked up and cognitively integrated information on various models of possible civilisations. The study draws attention to a perceiver's potential of co-ordinating his prospecting the consequences of behaviour with behavioural control. Therefore, the participants have been asked of prospecting the consequences possible in a given civilisation and report their judgements in two different ways. One concerns the measurement of Eigenvalue. Consequently, it may be expected that attitudes and beliefs about one-self are introducing more about cultural and economic differences than is suggested by projected cultural values and socialisation practices. The other concerns a filter effect that might be expected to work on the societal endowment of behavioural tendencies and integrate possible differentiation and separation by means of cultural layers, which constitute its shape becoming visible in the form of social texture. Both factors relate the participant's perceptual sensitivity and adequate judgement to novel sequences of events. In confronting different students with different types of civilisation in different environments it has been possible to demonstrate that competitiveness is the major source of variation in the development of Eigenvalue.

Competence as a Function of Competition–Success Interaction

From a geographical point of view, the urban areas of Singapore and Copenhagen in Denmark constitute very different conditions for making a living. However, it may be possible that Denmark and Singapore identified by (L), have developed quite similar civilisations. People all over the world appear alike in their concern about those factors that operate and influence civilian development. There are many examples of the assumption that cultural factors operate and that schooling is responsible for the major part of variations in preference for one or the other type of civilisation. Accordingly, ability and behavioural performance might cause attitudes and beliefs that are introducing more of differences in the individuals striving for means for making a living than is suggested by socio-economic developments in a certain environment. Therefore, a number of students from Singapore have been asked to participate in an experiment that would simulate for them some basic conditions for making a living in projected societies, displayed as Behaviour, Humanist and Growth models.

Instead of approaching this problem in the classical sense, it is proposed that competitiveness and success in performance are responsible for one's ability to obtain sufficient means for making a living. Consequently, it is expected that a competition–success interaction mechanism is differentiating the effects that can be taken as clues to differences in its determining force. In the experiment, a form of measurement (F) will be used, which consists of two factors. One (FI) is measuring the development of Eigenvalue. The other (FII) is measuring the Visibility of Social Texture. The results of the Singaporean sample will be compared with that of an earlier similar study on Danish students. When the groups of students from different countries as well as the projected models are contrasted, it will become evident that the students differ in their perceptual sensitivity. However, they may be sensitive to the same kind of ecological information. Concerning the governing impact of the competition–success interaction it is expected that (1) competition makes up the major force in their development of Eigenvalue, and that (2) success makes up the minor force, because it concerns conservation of success in the form of Visibility of Social Texture.

This study is the result of a co-operative effort, aimed at the development of a scientific foundation for the study of competence. Instead of approaching this problem in the classical sense (e. g. Johnson, Maruyama, Johnson, Nelson, & Skon, 1981) it is proposed that competitiveness and success are responsible for the single individuals ability of critically examine ideas and to act responsibly on the basis of communicated ideas. Consequently, competence is conceived of as a prerequisite for the attainment of life quality. The competition–success interaction is generally conceived of as a means for fostering competence. Kohn (1986, p. 22) portrays it in the following way:

“To compete is to strive for goals, to learn competence, to reach for success. Without competition, even minimal productivity, to say nothing of excellence, would disappear”.

Thus, degree of competitiveness in task orientation and the possibility of success are assumed to govern selectively the development of competence and consequently the production of sufficient resources for making a living. Hence, the major assumption made is that the experimental separation of these two factors is required in the study of competence.

Competition concerns the individual's capacity for achievement, which is assumed to operate in the assignment of his place in a social system. This factor performs the selective function in any civilisation. At present no other means have been proposed to exist for that purpose. The other factor is success and concerns the individual's ability to grow in performance. This factor is related to his possibility of achievement. Together, competition and success are operating in the determination of personal growth and in the development of the individual's sense of justice. It follows that the differentiation of these factors should give clues to differences in the qualitative behavioural leaps toward higher forms of competence as well as differences in life quality.

An experimental demonstration of individual sensitivity to different conditions for making a living will require an answer to the following questions:

1. What is the kind of competence that the single individual has been able to develop?
2. What is his behavioural response toward the working of the competition–success interaction when it is embedded into a particular societal context?
3. What is his perceptual power of discrimination of the effects of this mechanism?

To get control over this kind of questions, the simulation technique is suggested, because it removes the requirements of the natural habitat. Thus, an experiment has to be designed that can account for data, coming from different tasks and different environments. One apparent problem in the interpretation of experimental results from traditional studies emanates from the role that natural habitats play in these studies. Inherent in any naturally developed societal context is the requirement that the individual develops an understanding of what is right and what is wrong in a given situation.

The technique of simulation would make it possible to test perceptual discrimination without interference of the familiar context as constraining or facilitating factor. Moreover, it would have the capacity to establish a physical link between the known and unknown relationships of ecological significance. To run a simulation, it is essential to concentrate on a sequence of events of projected societies that to various degrees promote personal growth in the form of “individuation” and selection. Further, some perceptual functions have to be activated in order to pick up ecologically significant information associated with competence at the abstract information processing level. In the present experiment, all participants have been required to mark their extraction of informational invariants and orientation in relation to the particular model societies as well as in relation to the societies they live in. Hence, it has been essential to build up an experimental design that can control the effects of successive contextual encapsulation of competition and success as well as the processes of their perceptual discrimination.

The problem of staging the development of appropriate behavioural strategies in relation to a given society derives from the fact that the concept of “competence” can be studied in a meaningful way only when it is embedded into the context of a particular civilisation. Moreover, contemporary accounts of “competence” development are usually battered by an infinite number of degrees of freedom in the perspectivation of an appropriate strategy of approach, which satisfies the requirements of proper competence development and adaptation. How the mechanism of competition–success interaction may effect a particular societal development is indicated by the boundary conditions of two-by-two table for the study of competence

development given in Table 1, which has been reproduced from B. Bierschenk (1993). By competence is meant the quality on the basis of which the single individual activates his knowledge base and co-ordinates his actions. From the information processing point of view, this implies that competence is conceived of as synthesis of perception and action.

Table 1.

Two-by-Two Table for the Study of Competence Development

<i>Success (S)</i>	<i>Competition (C)</i>	
	<i>Frozen (c₁)</i>	<i>Unfrozen (c₂)</i>
<i>Frozen (s₁)</i>	Marginalisation	Sub-ordination
<i>Unfrozen (s₂)</i>	Co-operation	Co-ordination

The model of Table 1 shows what kind of controlling variables might govern the morphogenesis of competence. In order to build up an experimental design that can generate results that reflect the impact of the independent variables of Table 1, it is necessary to make explicit its conceptual basis and to demonstrate its theoretical significance for the discovery of effects, carried by the individual response patterns. The enforcement of the design variables of Table 1 is not as easily identified as “physical enforcement”, and consequently civilian justice in one’s opportunities of production, but may have far greater impact on one’s development of societal life.

Marginalisation (s₁c₁)

It is generally accepted that marginated people have poor chances within a social system. Moreover, those people are at a disadvantage in sharing assets and services. As individuals at the fringe of attention, they are comprehensively subjected to a description in economic, social and cultural statistics, but seldom in cognitive and never in mental terms. Under this condition the individual has minimal opportunity to effect the mechanisms that might foster his development of perceptual sensitivity and consequently competence. This condition is a clear reflection of the instrumental relationship between individual and society.

Co-ordination (s₂c₂)

Maximal freedom to participate in system development is commonly attributed to key persons in a given system. Co-ordination makes implicit reference to an autonomous and responsible agent who manifests the highest stage of co-ordinative freedom in the harmonious adjustment or interaction with various sub-systems. Hence, this agent represents the highest form of attentiveness as expressed in his perceptual judgements of task demands. The task of this kind of persons is typically independent of routine work, but dependent on information of high precision and reliability. Such a person is competent to the degree to which he is confident of his information needs and his control over his concepts and dynamical development of conceptual relations.

Co-operation (s₂c₁)

No reference to any attentive agent is made. Instead this condition refers to co-operative acting parts of a system. Moreover, no reference to individual analysis and judgement is involved. For example in system theoretic terms, co-operation means

that several organisational levels concur in producing an effect. From below, system cohesion is maintained by the activity of its parts. From above, the system is maintained by the boundary conditions of the co-operation. Further, this implies the ideology of forming consensus. The dynamic relation between the lower and upper parts provides additional support. “Human resources” are managed and hierarchies are the familiar organisational principle. Successive introduction of new steering and control systems guarantee highly differentiated societal functions.

Sub-ordination (s_1c_2)

A basic necessity for success is the presence of support, i. e., something that is solid and reliable in the production of goods and services. Sub-ordination of the single individual means sub-ordination under the condition that exists when practices of a controlling authority are different from what one commonly can expect socially or financially. Ambiguities in meaning of service lead to emotional instability. Furthermore, loss of support puts the individual into a non-successful and consequently inferior position that will arouse defensive behaviour.

For example, in contrasting the power of perceptual discrimination that is required under the condition of co-ordination with that of the condition of marginalisation, it is expected that these conditions are influencing perceptual sensitivity in different ways. Furthermore, it is expected that the governing mechanism under study is attracting awareness toward conceived requirements of conduct and one’s possibility of a competent approach to secure life quality. The interactive distance in Table 1 is proposed to be greatest between a prototypical society manifesting margined people and a natural habitat. By definition, the latter requires the highest forms of co-ordinative conduct. The degree of distance in the complementary interaction, defined by the conditions of the four-fold table, is assumed to be smaller. It follows that the asymmetry of the two types of interaction in Table 1 is the interesting outcome, because it is controlling the expression of the mental structures that may have impact on subsequent behavioural or professional competition and success in performance.

Within this framework, competition may be viewed as “performance” variation of developed competence. On the other hand success has more of specific (“ability”) loading. Therefore, the variables of Table 1 have been arranged in accord with the conventional design of the (nxp)-matrix, where (n) are the subjects and (p) the variables. The success of an individual subject in a given system is taken as success of a token of a biological system within civilisations of type (s_1c_1 through s_2c_2). It is the individual subject that provides the unique physical context for the expression of a particular level of perceived degree of life quality.

However, a behavioural theory has been lacking that can explain the way in which people comprehend contextual diversity and how people can have an overview of their conditions of making a living. It is possible to study experimentally the participant’s sensitivity to this mechanism by studying his reactions on the basis of test materials produced commercially by the Biological Science Curriculum Study of Boulder, CO in co-operation with Crystal Productions of Seattle, WA (B. Bierschenk, 1997). Built on extrapolated trends and tendencies in the United States of America in the 1970s, the test materials comprising audio-visual slides give contextual expression to various environments (Lee & Mayer, 1976). They are aimed at attracting the attention of the participant to three sequences of events or aspects of modern life. As shown in B. Bierschenk (1988), each one is based on one of the conceptual relations

of the design matrix shown in Table 2. At present, a theory that can guide the interaction and extraction of extrapolated trends and tendencies of modern societies into people's development toward "citizenship" is lacking. Hence the basic idea of experimenting with the models of Table 2 is that an interpretation of "citizenship" cannot take place independent of an effort to base the interaction mechanism of Table 1 on some theories of behaviour.

Table 2.

Design Matrix

<i>Paradigm</i>	<i>Model</i>		
	<i>Behaviour</i>	<i>Humanist</i>	<i>Growth</i>
<i>Association</i>	A/B		
<i>Structure</i>		S/H	
<i>Process</i>			P/G

The notion of overview or perspectivation implies the study of the relationship of Table 1 by means of the paradigm–model interaction of Table 2.

The A/B-relation

The Behaviour model is a clear reflection of the paradigm of association and thus the instrumental relationship. It is based on the possibility of modelling behaviour by means of scheduling and reinforcement. The simplicity inherent in this paradigm-model relationship is building on the idea of instrumental conditioning and reward. The prototypical society of the Behaviour model, for example, is based on the paradigm of association and opens with an event in which a young man is rescued from under-nourishment and is suffering from amnesia. Successive events model the functioning of a society that develops in agreement with Skinner's "Walden Two".

The S/H-relation

The Humanist model is a clear reflection of the structure paradigm and follows evolutionary principles. Successive events are moulding the functioning of a prototypical society that gives highest values to nature and human dignity. A community is emerging, which has been founded on humanistic and ecological values. Despite access to a sophisticated technology, ecological practices are stressed. This is illustrated through the events of a young man who gets to know himself and his environment. Thus the prototypical society is based on the idea of sub-ordination as well as on the initiation of some development in self-awareness. Increase of consciousness refers to a capacity by which the single individual can begin to reason about "self" and pay attention to others. The process of forming a hypothesis and transferring perceived mental states to others is basically determined by the individual's ability of making similarity judgements (e. g. Povinelli, 1993). Moreover the process of inferring similar mental experiences in other organisms implies the ability of attributing mental states to one-self and others. The degree of "self"-recognition within a certain environment constitutes the foundation for one's comprehension of otherness (Gallup, 1970). Likewise, a socially attractive presence of support means that something is current that is truly solid in gaining skill and knowledge, but authority is controlling the demands. Furthermore, ambiguity in meaning may easily arouse emotional instability.

The P/G-relation

The Growth model is a clear reflection of the process paradigm. The concept of “process” has been created to state movement dynamics. According to the process theoreticians an event is the smallest significant unit. It is the foundation of a prototypical society in continuous growth. Both population and technology is growing. The resulting society is seen through the encounters of a young man on his way to a city. The functioning of continuous growth and technology is illustrated in the way things happen as when the dynamics of the control mechanisms become out of order. Typical for this condition is the co-operative approach, which means that many variables operate on several levels concurrently. From below, the cohesion of systems of interacting variables is maintained by constricting the variables to exactly the kind that is strictly required for running the system. Therefore, the Growth model may be conceived of as representative of a prototypical society where boundary conditions are external to the required operations for steering and control. However, by pooling societal levels the operations within this model are supporting the relation between steering and control.

It follows that evidence for the two assumptions of the matrices of the Tables (1, 2) has been produced according to the following statements:

Statement 1: Competition and success are nesting prototypical societies as demonstrated in Table 7.

Statement 2: The prototypical societies are themselves nesting perceptual sensitivity to differences in developed life quality as demonstrated in the Figures 1 and 2.

If it is assumed that the variations in the conditions of competition and success, the variations in the model societies and their co-variations and interactions with the perceiver’s sensitivity give rise to differences in perceived basic conditions, then differences in perceived life quality can be expected. However, to demonstrate change and non-change in the degree of perceived variations in basic conditions means to demonstrate sensitivity to the co-operative interaction of competition with success. In this regard, the crucial problem of how to measure perceptual sensitivity has been solved by defining the boundary conditions of competence operationally on the basis of the model societies (B, H, G). Thus, the task of the participants in the experiment is to imagine themselves making a living within the framework of real and simulated societies, where a real society is indicated with (N) marking the conditions of a natural habitat.

Whether and to what extent the event sequences of the models are co-varying with the basic paradigms underlying the models will be studied by following Cooley and Lohnes (1971, pp. 227-228) recommendations for a multivariate hypothesis formulation. It follows that the basic question of testing concerns the “realness” of the differences among the model centroids or means vectors. Consequently, the hypothesis of no differences in the variance-covariance matrix will be associated with (H_0). This hypothesis can be formulated as

H_0 : The grand centroid (\mathbf{m}) is the best estimator of the population centroid (μ), because the model centroids (\mathbf{m}_k) for ($k = B, H, G, N$) are negligible.

However, when the null hypothesis is rejected, the estimator of the research hypothesis effects is the matrix of deviations of the means of the models from the grand mean, (Δ). Therefore, the multivariate test of discrimination power measurements will be associated with (H_2), which can be formulated as

H_2 : The perception of the models reflects discrimination power. This is the centroids hypothesis of ($\mu_k = \mu$) as measured with Wilks' (1932) lambda, which is defined within the general correlation framework as ($\Lambda = \mathbf{W}/\mathbf{T}$). Hence it is the generalised eta (η). It follows that the MANOVA (η) is similar to a "multiple correlation".

Thus the effect-size index used in the studies is ($1 - \Lambda = \eta^2$), which is a multivariate generalisation of Fishers correlation and a measure of the correlation between a test and the functions of discrimination. If (H_2) is accepted, it will be of interest to study the variations in the models on the basis of the hypothesis (H_1), which is the hypothesis of equal group dispersion matrices. This hypothesis can be formulated as

H_1 : The (k) models (= B, H, G, N) have a common dispersion, (Δ).

When (H_1) can be accepted, it is possible to by-pass otherwise awkward problems, posed for further MANOVA study. In the following the analysis will be concerned with the question: To what degree do the effects of (k), represented by the models, manifest differences in location of the models on the continuum of the form of measurement, which will be provided in the result section.

Method

Participants

The present experiment involved a group of Singaporean students. It was scheduled for one hundred first year university students and carried out in March 1998 with 99 students. These students were enrolled in the School of Building and Real Estate, Faculty of Architecture and Building at the National University of Singapore. Of those who showed up for testing were ($N = 29$) male students and ($N = 70$) female students. The Singaporean student respondents were mainly of Chinese ethnicity³. Generalisation in a strictly statistical sense therefore pertains only to the studied group until demonstrated otherwise. It means that only a restricted number of statistical procedures can be used. In addition, a similar study has been earlier conducted with a group of Danish students ($N=162$) in Copenhagen, the capital of Denmark. Composition and methodology of the Danish study has been reported in B. Bierschenk (1998c).

Materials

The selection of the test materials has been made on the assumption that competent people have integrated experience with various degrees of life quality which they communicate with a unique perspective. Dependent on their competitiveness it will be of interest to contrast the perceptual sensitivity to various degrees of life quality. The question is whether and to what extent differences in boundary conditions can be simulated. If differences can be staged, in what ways do they influence attribution of certain levels of life quality in a particular society? Moreover, to what extent are they particularising the three sets of audio-visual slides produced commercially by the Biological Science Curriculum Study of Boulder, CO

in co-operation with Crystal Productions of Seattle, WA? Built on extrapolated trends and tendencies in the United States of America in the 1970s, these audio-visual slides give contextual expression to various societal developments. As “Projections for the Future” (Lee & Mayer, 1976), they are aimed at attracting the attention to the B-, H-, and G-model of Table 2. The slides have been studied previously. In these studies, it has been shown that they are valid in the assessment of the individual’s perceptual sensitivity to environmental information (B. Bierschenk, 1987, 1988, 1989, 1992, 1997, 1998a, 1998b, 1998c; Bierschenk, Helmersson, & Lohmander, 1987; Bierschenk, & Marker, 1998; I. Bierschenk, 1997, 1998a, 1998b; Elstrup-Rasmussen, 1998).

Design and Procedure

The proposed approach relates to the interaction between the mechanism of perception and the formation of response patterns in the form of preferences. With reference to ecological perception, it can be stated that it is important to find its informative components (Gibson, 1979). This means that the problem of “certainty in preference” for one or the other societal development gives expression to its mental determinants and the fundamental ability of the individual to make the self–other distinction.

For that purpose, in the Danish study it was possible to achieve a Latin-square design, which made it possible to control the treatment effects. Consequently from the experimental point of view, the Danish students have been grouped in two dimensions. The first was designed to control their School association, while the other had to control the order of presentation of the “experimental units” (Cox, 1958). Concerning the perception and judgement at the ecological level of information processing, a model has been developed whose kernel consists of two factorised components (FI, FII). These are representing the marker variables concerning information on various civilisations. The measurement approach taken is essentially concentrating on sequences of events that to various degrees promote “individuation” and “selection” (Ghiselin, 1981). Both factors are fundamental for competition and success, and consequently entwined in the concept of “competence”. Competition is assumed to contribute to the individual’s development of “Eigenvalue” (FI), while “success” is expected to influence the Visibility of Social Texture (FII) of a particular society. In previous studies, both (FI, FII) have been established as controls of adaptation to new situations that might be similar but are definitely not identical with those encountered in one’s native context.

Moreover, in the process of measuring, every item has been randomised for every experimental unit and every subject. The same measuring process has been applied in the present experiment (Singapore). However, the Latin-square design of the previous study was not possible to realise. Consequently, the instructor of the student respondents collected the Singaporean students in a large lecture theatre. Thus, only one session was held, which means that all student respondents were exposed to the same test situation. The presentation of the models was carried out with the (B-H-G-N) order, where (N) represents Singapore. The presentations lasted about 40 minutes. The absence of an efficient control of the experimental units requires that all ANOVA and MANOVA results will be reported in a descriptive fashion. Consequently, the appropriate Tables of the statistical analyses will contain only the descriptive measure of (η) but not F-ratios and probability values. Finally, before presentation of the slide series, the participants were asked to read the test instructions given below, which were also read aloud to them:

INSTRUCTIONS

You will be shown a picture series on video presenting a vision of a modern society where current trends have been allowed to progress even further. It is intended to give you the opportunity of imagining yourself as part of this society. You are asked to try and picture yourself in this society in such a way that you can form a clear conception of basic conditions, which would influence your life, if you were to live there.

After the display, you will be asked to give an account of your situation within the society depicted. You are to evaluate a number of statements about life there. In your assessment you may want to keep in mind some events or characteristics you find worth of serious consideration. You can do this by indicating how true or untrue you think each statement is with regard to the society by giving it a grade from 0 to 9. If you think it is "very certain" you should give it a 9, whereas if you think it is "not at all certain", indicate this by giving the statement a grade of 0. The degree of truth in each statement can be expected to vary, so don't hesitate to use the entire scale from 0 to 9. Please complete your assessment fairly quickly. Try and keep up a good pace, but don't leave anything out. Avoid making unnecessary corrections.

Thereafter, the three sets of slides were shown on a large screen, which made it possible that all students could watch each and every presentation at once. After presentation of each set of slides, the students were asked to mark the following items:

- A. *I am able to travel both within the country and abroad as I please.*
- B. *I can direct my development on my own premises.*
- C. *My right to privacy is guaranteed.*
- D. *I can participate freely in organised opposition to those in power.*
- E. *I can deal with the various aspects of my overall situation without undergoing undue stress.*
- F. *I have the possibility of adapting my life to major changes in society.*
- G. *I can choose the job I wish.*
- H. *I can do whatever I like, as long as I do not infringe upon the rights of others.*
- I. *I can make an active contribution to the re-evaluation of accepted morality.*
- J. *I can obtain the education best suited to me.*
- K. *I encounter new technical solutions in my everyday life.*
- L. *My position in society depends upon the educational system.*
- M. *My health depends upon society's technological development.*
- N. *I can realise all my material desires.*
- O. *My status in the society depends upon my education.*

If we assume with Gibson (1979) that these items are manifesting perceptual sensitivity at the ecological level, it means that higher order relations form the common basis for information pick-up. These have to be made evident through their invariant combinations and must capture both the structure- as well as the texture-dimensions. With respect to structure, it is proposed that the perceiver, watching the development of an episode, is picking up information about movements from the video display. However, the optical patterns of the displayed episodes are generating specific texture flows with their characteristic invariants. Relating event structures with direct information pick-up is supporting the invariant components underlying

perceptual sensitivity and thus the ability of discrimination. In sequence, every statement embodies a particular state of attention. One concerns the development of Eigenvalue (FI). The other relates to the Visibility of Social Texture (FII).

The multivariate analysis of the Singaporean experiment concerns the possible correlation of these two factors. Thus attention is paid to the $[p(p-1)/2]$ different co-variances among the variates as well as to the (p) means and the (p) variances. Accordingly, the mathematical model on which the analysis of a sequence of events in an episode is based is perceivable over a two-dimensional test-vector. Attention is assumed to co-vary with the degree of precision that the vector provides for the establishment of a multivariate normal distribution. It follows that the experimental study of ecological information processing in the first place should show if and to what degree the factor structure of both perceptual components is reproducible.

Results

The results to be presented in this section relate partly to the problem of the reproducibility of the form of measurement (F), partly to the problem of civilian development in Singapore and its relationship to corresponding developments in the Danish society. The comparisons are made to reveal more clearly those factors that operate and influence civilian development. The reproducibility of the factors (FI, FII) is shown in Table 3.

Table 3.

Reproduced Factor Structure of the Form of Measurement⁴

Variable Item	DK1998: Factor I	DK1998: Factor II	SG1998: Factor I	SG1998: Factor II
A	.78	.17	.58	.39
B	.84	.06	.74	.17
C	.79	.08	.68	.24
D	.80	.06	.68	-.03
E	.49	-.33	.62	.06
F	.65	.15	.65	.07
G	.74	.05	.65	.35
H	.75	.03	.64	.19
I	.76	.14	.69	.07
J	.74	.23	.48	.56
K	.13	.62	.25	.49
L	.19	.79	-.02	.67
M	-.25	.60	-.06	.62
N	.42	.45	.33	.64
O	.19	.77	.08	.32

Concerning the demonstrated factor structure, it should be noted that this structure is studied with reference to a similar investigation of Danish and Swedish students. Because the Danes are most closely related to the present experiment and of approximately the same age, the results of the Danes are compared with the present study. However, compared to their Singaporean counterparts, the Danish students are still at the upper secondary level in their educational performance, while the

Singaporean students are at the tertiary educational level. Thus, the comparison is confined to these restrictions.

Similarity of Factor Structures of the Form of Measurement

The standard of comparison has been reproduced and consists of the factor structure, shown in Table 3. A measure of similarity of the structures can be obtained on the basis of the root mean square $\mu_{DS} = [\sum(\alpha_{jD} - \alpha_{jS})^2/m]^{1/2}$. Here (D) refers to Denmark, (S) refers to Singapore and (m) refers to the number of significant items loading on the respective factor, while (j) indicates the factor under consideration (Harman, 1967, p. 209; Rummel, 1970, p. 461). The similarity of (FI, FII) is calculated correspondingly. Unfortunately, no suitable statistical method exists for testing and determination of what kind of loading (α) should be considered a zero loading. Morrison (1967, p. 290) for example has shown that the mean error of (α) varies between $(0.7/\sqrt{N})$ and $(1.6/\sqrt{N})$. However, with the upper limit of the mean error as standard of comparison, an estimation of similarity in a factor structure can be given in the statistical sense.

For (FI) this criterion is well below of $(1/\sqrt{m}=1/\sqrt{10}=0.316)$, where (m) refers to the items on (FI). Thus, the latter measure is a proportionality constant with respect to the individual factor, but variable over factors, e. g., for (FII), this constant is $(1/\sqrt{m}=1/\sqrt{5}=0.447)$. This circumstance permits the determination of factor equality in the empirical sense. The application of Harman's formula to Table 3 has resulted in the values ($\mu_{DS} = 0.136$) for (FI), and ($\mu_{DS} = 0.232$) for (FII). Because the root mean square measure (μ_{DS}) is imposing very stringent similarity requirements on the set, for (FI) it can be concluded that the deviations loading of this factor are on the average below the mean error $(1.6/\sqrt{N}=0.16)$. The comparison of (FII) shows that this measure of distance is above the mean error (0.16), but it is well below its proportionality constant (0.447). Thus, the most important result is the reproducibility of the factor structure.

With reference to the Singaporean study a further test of the two factors (FI, FII) will be carried out. They will be used in the study of model differences in location in a multidimensional measurement space. Hence, the perceptual sensitivity of Singaporean students will be studied on the basis of a MANOVA design whose distinctive difference to the Danish study is that the dependent variable is a vector variable. Based on the ($N = 792$) factor scores of the Singaporean study, by means of the Anderson-Darling normal probability plot (MINITAB, 1998), it can be documented that the between models variance is ($A^2 = 0.1071$), and the level of probability for this value is ($p = .000$). It follows that this vector has a multivariate and approximately normal distribution. Furthermore, this measure confirms the (H_1) hypothesis of equality of the group dispersion matrices and justifies a MANOVA study of the data by means of a General Linear Model analysis (GLM).

A GLM Analysis for (FI) and (FII)

The structural model, underlying GLM, is quite similar to that of a multiple regression (MR) analysis, because both are alternative formulations. A GLM analysis implies a least square estimation of the factorial effects by generating mean values and marginal values. Based on the given marginal means, the generalised analysis of variance is easily carried out with the GLM procedures of MINITAB (1998).

The primary goal of this section is a GLM analysis. Tables 4 and 5 are holding a test of all terms that is based on (FI) and (FII) respectively. However, as mentioned

in the “Method” section, the subjects underlying Table 5 in no sense constitute a sample of the populations or part of the populations. Apart from this statement, if it is maintained that the subjects in the studies are instead an interesting group of young people in their own right, then it is appropriate to focus attention on descriptive measures of relationship between predictors and criteria, rather than on associated inference statistics. Thus all MANOVA and ANOVA results are reported in terms of a multivariate generalisation of the correlation ratio (η). As shown in the formulation of (H_2), the MANOVA (η^2) is a function of Wilks’s lambda (Λ) and has the same difficulty of interpretation that plagues univariate (η^2), but it gives a measure-statistic view on the reported effects as suggested by Cooley and Lohnes (1971, pp. 223-230).

Denmark:

Table 4 is showing the effects that are attributable to different sources of variation in the produced response patterns.

Table 4.

Denmark⁵: Effect-size Index for all Main and Interaction Terms

Measurement	Terms	η^2
FI	Model (M)	0.567
	School (S)	0.015
	M*S	0.041
FII	Model (M)	0.308
	School (S)	0.004
	M*S	0.034

Concerning (FI) and (FII), by means of previous analyses it has been demonstrated that both factors, treated as the two-dimensional test vector (F), have the same variance-covariance matrix for both the Danish as well as the Swedish population (Bierschenk & Marker, 1998). It means that (F) has the same dispersion for each population and (H_1) has been accepted.

All tests and F-ratios have been documented in B. Bierschenk (1998c). However, in the present context it is sufficient to reproduce the η^2 -values only. In passing to the Model-term of Table 4, it can be stated that the models explain all systematic variance contained in the data set. Furthermore, it can be said that the tiny proportion of variance, associated with the School-term, shows that the Latin-square design of this study, i. e., the random assignment of randomised sequences of models has been effective in the control of possible differences due to participating schools.

Singapore:

In Table 5, it should be noted that the analysis of differences in perceptual sensitivity is based on (F), which is the two-dimensional test vector of the previous study which has been shown to be multivariate normal in distribution. It means that the hypothesis (H_1), referring to the discrimination of (F), has been confirmed. Therefore, (F) will serve as basis for a study of all main and interaction terms concerning the Singaporean students’ response patterns as shown in Table 5. The characteristic property of Table 5 is that the dependent variable consists of the combined values of (FI, FII) and is treated as a test vector.

When the response patterns are analysed by means of all terms of variation, it is possible to screen the established effects in order to single out a substantial value.

Table 5.

Singapore: Effect-size Index for all Main and Interaction Terms

Terms	η^2
Form (F)	0.0359
Gender (G)	0.0016
Model (M)	0.1265
F*G	0.0003
F*M	0.0755
G*M	0.0018
F*G*M	0.0013

In the present context, it implies an effect of ($\eta^2 > .10$), that is ($\eta > .30$), which signals that ecologically significant information has been picked up. The Singaporean study contains a term for Gender, because in surveys and opinion polls it is usually assumed that a difference in gender is causing differences in comprehending the conditions of life. Therefore, the hypothesis (H_2) is studied, which means its differential power due to Gender grouping.

Obviously the perceptual sensitivity to environmental or model variations due to differences in sex is only superficially varying. Despite widespread and uniform investigations into sex differences such differences are of no import, because the explained variance is minimal. Thus, the zero-hypothesis of the grand centroid (\mathbf{m}) will be accepted as best estimator of the Gender centroid (\mathbf{m}_k). Moreover, the estimation of the factorial interactions of Gender with the other sources of variation, likewise show negligible effects. This means that neither the discriminating power of the form, nor the test of the effect of grouping by “Gender” has caused noticeable deviations from the grand mean. Therefore, it will be of interest to study the variations in the models on the basis of the accepted (H_1) hypothesis, which means from a univariate point of view.

Finally, the effect-size index concerning the interaction of the Model-term with the other sources shows small deviations. This is clearly an indication of successful discrimination and simplifies the interpretation of the Model effects. That the models have been determined a priori and analytically means that their conceptual basis is predefined and can be discriminated on the basis of (F). A sizeable effect implies that the mean differences in the manifested attention are exceeding the critical value of ($\eta^2 > .10$).

Univariate Analysis of the Intentional Use of Ecological Invariants

Development of Eigenvalue

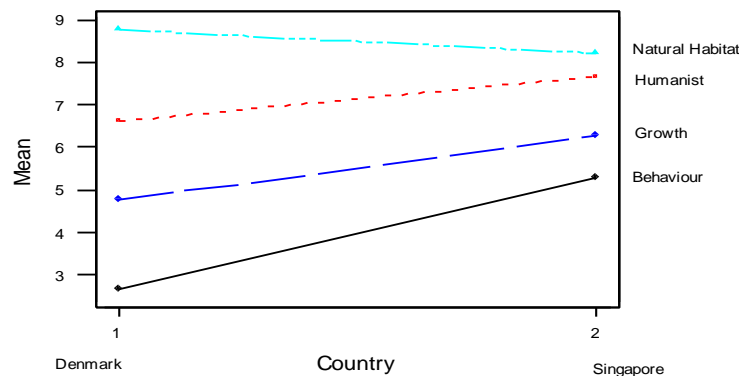
Denmark:

Figure 1 indicates that there is a value integrated with the function as expressed by the order relation of the models. The Danish students conceive all and every model as a prototype in its own right. All differ significantly and have their specific “depth-values” integrated with the perceptual function of (FI) (B. Bierschenk,

1998c), which has led to profound differences in the Danish participant's way of relating themselves to the displayed objectives and event sequences.

Figure 1.

Measured Eigenvalue (FI) over Countries



For the Danish students, the cues embedded in the Humanist model and its complex events of emergent Gestalts signal a greater possibility for the development of life quality, than the Growth model would allow. Because they have placed it above the Growth model. But they cannot or do not see enough similarity between these models and the N-model, i. e., the Danish society. With noticeable distance from all prototypes, the Danish students are most certain of their possibility of developing life quality in their own society. In this sense Denmark is outstanding.

With the established distances between the higher-order components, it is reasonable to expect differences in degree of developed competence. As previously mentioned the differences in picking up environmental information are significant and concern an analysis of what the Danish students have been aware of in their relationship to the models. Especially when the individual's judgements are evaluated and considered with respect to the total impact of judgement, the measured distance is an expression of the models in relation to the perceiver's personal concepts and thus perceptual constraints. Still, the structure of the Danish society remains unknown.

Singapore:

The relational order of the models is the same as in the Danish case and makes evident that the functional aspect of the Growth model has been picked up. In a follow-up of the contrasts of Figure 1, it appears that the N-model, i. e., the Singaporean society has been constraint due to its close relation partly to the Humanist, partly to the Growth model. From the structural point of view, the Singaporean society as well as the Danish society is at a notable distance from the Behaviour model. It follows that all participants have been able to differentiate the functional properties, related to the Growth model, and the structural properties, related to the Humanist model, from the instrumental properties of the Behaviour model. But their ways of differentiation are diverging. The ecological implication is that comprehension is dependent the kind of experience and practice that is included

in the process of judgement. It is linking the resulting response patterns of the Singaporean student to the prerequisites that are specific of the Singaporean context. This fact is fully demonstrated in Figure 2.

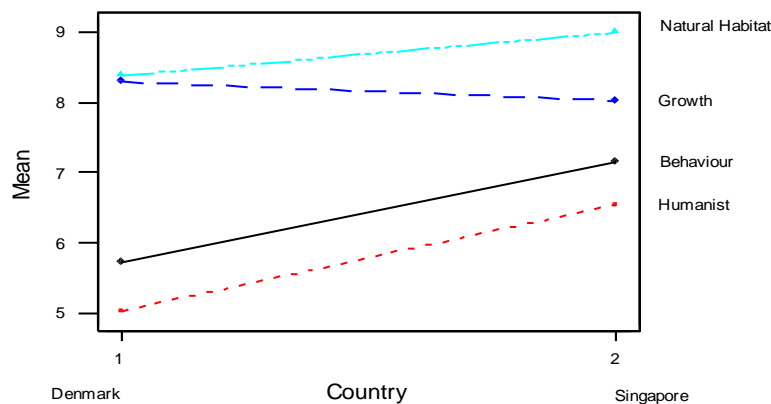
Visibility of Social Texture

Denmark:

As shown in Figure 2, the Danish students are concentrating on the Growth model. The relational order of the models shows the surface of the Growth model to be very close to the surface of the Danish society. It is especially the Growth model that communicates information, which invites to the abstraction of dynamic relations, whose boundaries must be determined cognitively.

Figure 2.

Measured Visibility of Social Texture (FII) over Countries



The results show that the display of the prototypical society of the Growth model transmits an atmosphere that is similar to that of the Danish society since it is influencing information pick-up in similar fashion. Hence, processing of the shape of a particular society is dependent on the milieu and thus on its capacity to filter individual success through properly developed forms of organisation. The level of certainty in perceived Visibility of Social Texture precludes the possibility that individual properties of shape are recognised prior to the formation of a “focal view point condition” (Sommerhoff, 1950).

Singapore:

The relational order of the models is of theoretical import. From an ecological information processing point of view, it is worth noting that the differences between (B, G, N) are all small. This implies similarity of perceived texture. Though there is nothing deterministic in the perceptual process that would require some choice between the models. Therefore, it is an unexpected result that the models as source of shape variations in the case of Singapore have had only negligible effects on the

individual's information pick-up and transformation. Figure 2 reflects recognisable distance of certainty only when perceived Visibility of Social Texture of Singapore is compared with the Social Texture of the Humanist model. Hence, the related models (B, G, N) appear to have a higher filter effect.

In conclusion, the episodes of the model societies, carrying the conceptual information, can be likened to the simulation of life in three different societies with different kinds of social filters. It is demonstrated that these are mediated by marker variables that do not correspond directly to easily distinguishable organisational properties. Obviously, change in the perspective of the participants is the result of their ability to extract and abstract transformational invariants. Since the perception of different degrees of Social Texture must be regarded to be of fundamental import for one's civil orientation, changes over the perceptual dimension of (FII) should contribute to its determination. As shown, if and only if persistence in perspective can be demonstrated, it is possible to make evident that the transformation of experience with one type of Social Texture to another has mental significance.

The Binding Conditions of Competence

By nesting the models of Table 2 under the conditions of Table 1 as shown in Table 6, it is possible to discern how model sensitivity can be explained within the framework of competition and success.

Table 6.

Two-by-Two Table for Fully Nested Models

<i>Success (S)</i>	<i>Competition (C)</i>	
	<i>Frozen (c₁)</i>	<i>Unfrozen (c₂)</i>
Frozen (s ₁)	Behaviour	Humanist
Unfrozen (s ₂)	Growth	Natural Habitat

By referring to the macroscopic level of the treatment matrix of Table 6, it is conceivable to examine how the variables of competition and success have influenced the judgement of the models. Because it has been shown that the models co-vary with perceived or conceived development of Eigenvalue and the Visibility of Social Texture, now it is possible to study, how these variables interact with perceived changes of the students' perceptual discrimination.

However, searching for significant relations between the models as dependent variables and competition and success as the independent variables, first requires the establishment of proper experimental conditions. Possible sources of effects that may be confounded with the grouping of the Singaporean study can be ruled out by placing the Singaporean students into the context of the Danish study and to consider them to be simply an additional "School". If there is still no School-effect, it can be assumed, as Campbell and Stanley (1963, p. 222) understand it, that this measure is changing the quasi-experimental design of the applied Latin-square into a true experiment. Table 8 shows the result of the ANOVA of "School" as source of variation.

As shown in Table 7, the Latin-square has been efficient in securing an equal treatment of the Danish students and their matched fellows in Singapore. All experimental conditions have been held constant within every experimental unit. The results of Table 7 can be taken as confirmation for the treatment of the Danish and Singaporean Students within one and the same experimental frame of reference.

Table 7.*ANOVA of School as Source of Variation*

Test	Source	DF	SeqSS	AdjSS	AdjMS	F	P	η^2
FI	School	5	363.01	363.01	72.60	9.74	0.000	0.04
	Error	1037	7732.05	7732.05	7.46			
	Total	1042	8095.06					
FII	School	5	173.92	173.92	34.78	6.03	0.000	0.03
	Error	1037	5979.88	5979.88	5.77			
	Total	1042	6153.80					

It follows that competition and success are the unconditional prerequisites for competence development and consequently the attainment of life quality and can be studied as shown in Table 8. The sizeable main effects of competition as well as success concern Eigenvalue as well as the Visibility of Social Texture. Concerning the development of Eigenvalue, the presented results give empirical evidence for the assertion that competition is its unconditional prerequisite. This is an extraordinary demonstration of the validity of the statement in the citation (see page 3).

Table 8.*MANOVA of the Completely Crossed 2⁴-Design for FI and FII*

Source	η^2	DF	F	P
Success (S)	0.172	1, 2074	432.27	0.000
Competition C)	0.118	1, 2074	279.03	0.000
Form (F)	0.061	1, 2074	136.40	0.000
Land (L)	0.054	1, 2074	119.28	0.000
S*C	0.003	1, 2074	11.03	0.000
S*F	0.011	1, 2074	24.37	0.000
S*L	0.025	1, 2074	21.59	0.000
C*F	0.154	1, 2074	378.86	0.000
C*L	0.006	1, 2074	13.09	0.000
S*C*F	0.005	1, 2074	11.74	0.001
S*C*L	0.000	1, 2074	2.35	0.719

The intertwined logic of competition and success indicates that the Visibility of Social Texture interacts with the filtering of success, while competition co-varies with the development of Eigenvalue. This is confirmed by means of the response patterns of (FI) on one hand and the Visibility of Social Texture (FII) on the other. Hence, appearance of productivity or excellence is the expression of reached success. The results of social filtering are shown in Figure 3.

The results make evident that the Danish and Singaporean students alike have clear and unmistakably perceived the competitive condition of their Natural habitats as pre-requisite for their development of Eigenvalue. Moreover, both groups of students have manifested their ability to achieve a constructive conduct vis-à-vis the competitiveness of their societies. When picking up the cues of competition,

simultaneously they are conceiving themselves as directing their actions in a co-ordinative conduct to their natural habitat.

Figure 3.

Eigenvalue as a Function of F–C Interaction of Table 9



In re-observing the assertion of the citation (on page 3) with respect to Figure 3, it can be stated that competition governs and controls the degree to what Eigenvalue develops. On the other hand, competition is far lesser involved in the expression of the Visibility of Social Texture. Individual success, when evaluated within the framework of an extrinsic co-ordinated action space is primarily dependent on proper conditions of filtering performances.

The major goal of the presented analysis has been to compare the Singaporean with the Danish environment. At the highest possible level of analysis, it has been demonstrated that the perceived differences concerning competition are negligible. Danish and Singaporean students' are alike in their certainty concerning the possibility of competition. Filtering of individual success, however, depends on the shape of a particular society and its capacity to provide for growth in performance. Hence, perceived filter effects in turn imply perceptual sensitivity to the nature and limits of the citizen's learning opportunities and their conception of possibilities for re-establishment. In this sense, the study has demonstrated that both groups of students are alike in their consciousness of the mechanisms of selection, because selection makes sense only against a legal and consequently a civilised way of manifesting regard of individual success.

Discussion

In conclusion, it has been possible to demonstrate perceptual sensitivity to visual stimulation. This means that all students have been able to detect changes, which are specific for the characteristic variations of the projected model societies. The nature of their involvement with the model societies is determining competence positively. In acting competently, the students have shown that they can discriminate between life quality that has changed. Thus acting with competence is different from

acting on qualifications. The difference is attributable to the fact that competence requires detection of transformational invariants, while acting on qualification rests on the discrimination of identifiers of the standards of living in a certain society. Further an investigation into perceptual competence requires the student to detect structural invariants. In manifesting competence, he must be able to observe structural unity and give evidence of his identification with those structures. It follows that changes in identification refer to the student's change in "ego-motion", that is his own displacement in relation to a given model society. Ego-motion contrasts with locomotion by being transformed into the development of Eigenvalue. But perceived Eigenvalue is evidently dependent on competitiveness.

The phenomenon of "frozen" competition has been studied in the form of co-operation (condition s_2c_1) since the 1920s (Johnson, Maruyama, Johnson, Nelson, & Skon, 1981). These authors reviewed a great number of studies concerning co-operativity as condition of certain models of group interaction. The results of their meta-analyses have to be evaluated in the light of the sets of variables used. The analyses carried out are based on highly correlated sets and consequently useless in any real situation. Disregarding for a moment this fact, the results of the meta-analyses have shown that the typical problems associated with this kind of studies remain unsolved. Hence, it has been difficult to provide evidence for successful separation of intra-group competition from co-operation. When co-operation is compared with inter-group competition, it is evident that co-operativity is no advantage.

It follows that the closeness of the conditions of success of the Behaviour and the Growth model to the Singaporean society makes it to appear more rigid in its filtering of individual performances, but gives no overwhelming superiority over the Danish society. Obviously, organisational complexity varies, but can be made to appear more or less rigid. It is clear that Singaporean student perceive the "frozen" condition of success of the Behaviour model society as only trivially different from a society of Singaporean shape. But with reference to competition, it can be concluded that the capacity of the Singaporean society to produce "Eigenvalue" is of the same degree as the capacity of the Danish society.

The critical constraining filter effect of the mechanisms of advanced hierarchical organisations and bureaucracy has in both societies the same kind of limiting influence on the manifestation of excellence. The main effect of the success-condition is a demonstration of the fact that Danish as well as Singaporean students clearly conceive the utilisation of success as normatively prescribed attributes of co-operative efficacy and rationality. But it is reasonable to interpret the slight co-variation of the second dimension (FII) with the competition as a certain degree of discharging the means and functions of planning and channelling the exercise of power. These are also the major limiting forces of the individual's course in his acquiring of economic prosperity. Further, both groups reflect concern with the filtering, mainly through education, because education is conceived of as a means to gain privilege justice in the organisation of welfare and the rise of one's standard of living.

The asymmetrical and complementary co-variations between competition and success mark in both cases discerned firmness to prevent power planning and the development of operative strategies that may gain access to one's way of developing Eigenvalue. This transforms finally in a discharge of the binding forces of bureaucracy. However, a law-regulated regime is expected to be the necessary condition for maintaining justice in the functioning of legal filter mechanisms. Hence,

the Visibility of Social Texture is the proper form of manifesting individual success. Visibility of Social Texture is the perceived means to further opportunities for choice and to respond with productivity to made choices. Being able of functioning effectively in running and controlling an organisation or some sub-systems transforms in all cases into noticeable sensitivity to variations in performance. Evidently, the kind of demonstrated perceptual competence is of most fundamental concern to society, because it may be conceived of as a demonstrative definition of the reciprocal condition between competence and the development of life quality. To some readers, connecting both may seem provoking but competence in this sense has never been studied.

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³Singapore is situated close to the equator, and in the South-eastern part of Asia. It is an island city-state of 640 square kilometres. It has a multi-racial population of 3.5 million in 1997, of which 77.4% is Chinese, 14.2% Malay, 7.2% Indian, and 1.2% persons of other ethnic groups.

⁴Note. DK 1998: Students (n=162), distributed over five City Schools (gymnasium) in the Capital of Denmark and in their third and final year of study. SG 1998: Students (N=99) in their first year at the National University of Singapore, School of Building and Real Estate, Faculty of Architecture and Building.

⁵From "The Basic Conditions of Life. An Ecological Approach to Perceptual Sensitivity of Swedish and Danish Students" by B. Bierschenk, 1998c, *Kognitionsvetenskaplig forskning*, No. 67.

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